

3.6 Economics

This section documents the economy of Utah and Salt Lake counties and the impacts of Alternatives 1 and 4 on the regional economy. Historic and expected future employment and historic unemployment rates are used as the indicators of the economy of this area.

Information for the description of the existing and expected economy was obtained from the Bureau of Economic and Business Research (BEBR), Economic Development Corporation of Utah (EDCUtah), Utah Governor's Office of Planning and Budget (GOPB), Utah Department of Workforce Services (UDWS), Mountainland Association of Governments (MAG), Mountainland Economic Development District (MEDD), and the Utah State Tax Commission.

The impacts of the project alternatives on the economy of Utah County and Salt Lake County were determined through the following analyses:

- Regional economic impacts;
- Business operations;
- Estimate of tax revenue lost due to conversion of private property to highway right-of-way; and
- Impacts of construction capital investment.

3.6.1 Affected Environment

The I-15 corridor is located within the Provo-Orem and Salt Lake City Metropolitan Statistical Areas (MSA). This U.S. Census designation reflects the social and economic integration of the region. As the most densely populated areas of the state, the Salt Lake-Ogden and Provo-Orem MSAs have the major share (80.7 percent) of all the jobs in the state (EDCUtah, 2006).

I-15 also plays an international economic role as it is a key NAFTA (North America Free Trade Agreement) corridor and CANAMEX Corridor, linking Canada, the United States and Mexico and providing an important corridor for national and international goods movement.

Employment in Utah and Salt Lake counties has grown substantially over the last several decades and dramatically since 1980. The civilian labor force in Utah County more than doubled between 1980 and 2006, and has remained steady throughout the 2000s, peaking to 202,005 in 2005 before decreasing in 2006 and 2007 to 171,719 (UDWS, 2007b). Non-farm jobs grew by nearly 5 percent between 2005 and 2006. Construction jobs have had the strongest job growth, increasing at a rate of 16 percent in 2006 (UDWS, 2007e).

In 2006, there were nearly 742,000 jobs in Utah and Salt Lake counties. The majority are in four sectors: Trade/Transportation/Utilities (TTU), Professional Services, Government, and Education and Health (EDCUtah, 2007a and EDCUtah, 2007b).

In Salt Lake County, in 2006 the civilian labor force increased 104 percent since 1980. The labor force has continued to grow steadily in the early 2000s (Utah Department of Workforce Services, 2007b). In 2006, non-farm jobs in Salt Lake County grew by nearly 4.5 percent from 2005 (Workforce News, 2006d).

Figure 3.6-1 and Figure 3.6-2 illustrate the growth in non-agricultural employment, by county. Jobs in the trade and service industries have increased dramatically over the last decade, while mining and manufacturing employment has begun to level off in both counties. Additionally, the construction sector saw an upsurge during the 1990s that has remained steady over the last 15 years (GOPB, 2005).

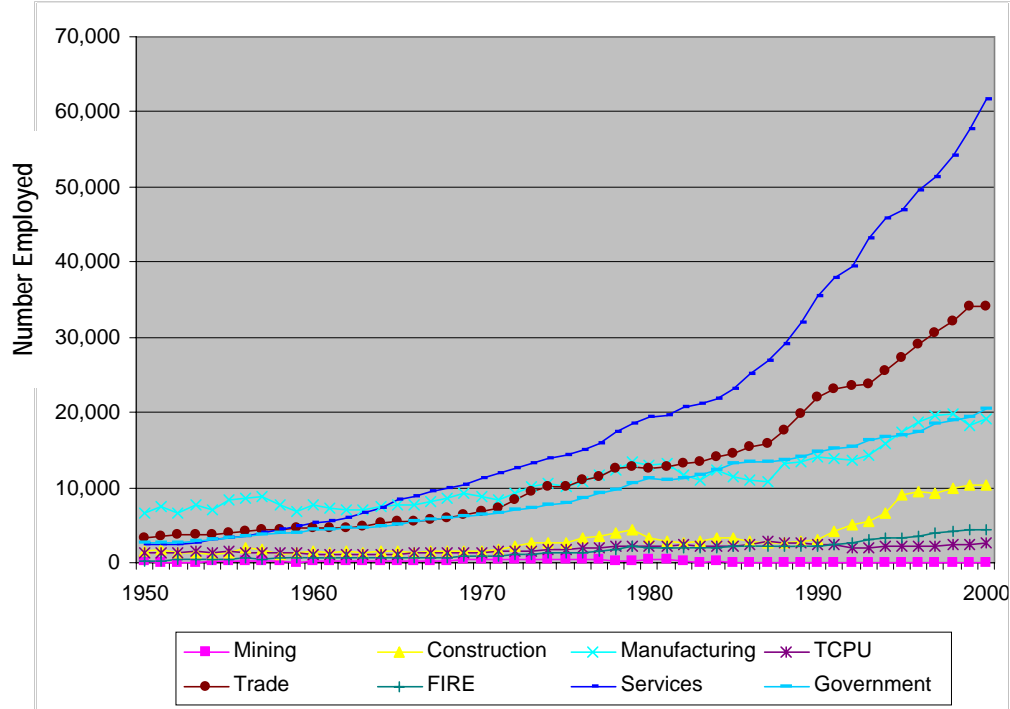
The GOPB develops estimates of employment growth into the future, by county. Figure 3.6-3 shows the expected growth in employment in both Utah and Salt Lake counties. The Utah Department of Workforce Services predicted that retail trade will continue to provide employment throughout the region, offering more job openings than any other occupation in the state between 2004 and 2014 (UDWS, 2005).

The strong economy is also reflected in the trend in unemployment rates since 1980. Figure 3.6-4 shows the general downward trend in unemployment rates historically. From a statewide peak unemployment rate of over 9% in the

early 1980's, unemployment rates have declined to about 4% in Utah County and 4.4% in Salt Lake County in 2005 (Utah Department of Workforce Services, Workforce Information, 2006a).

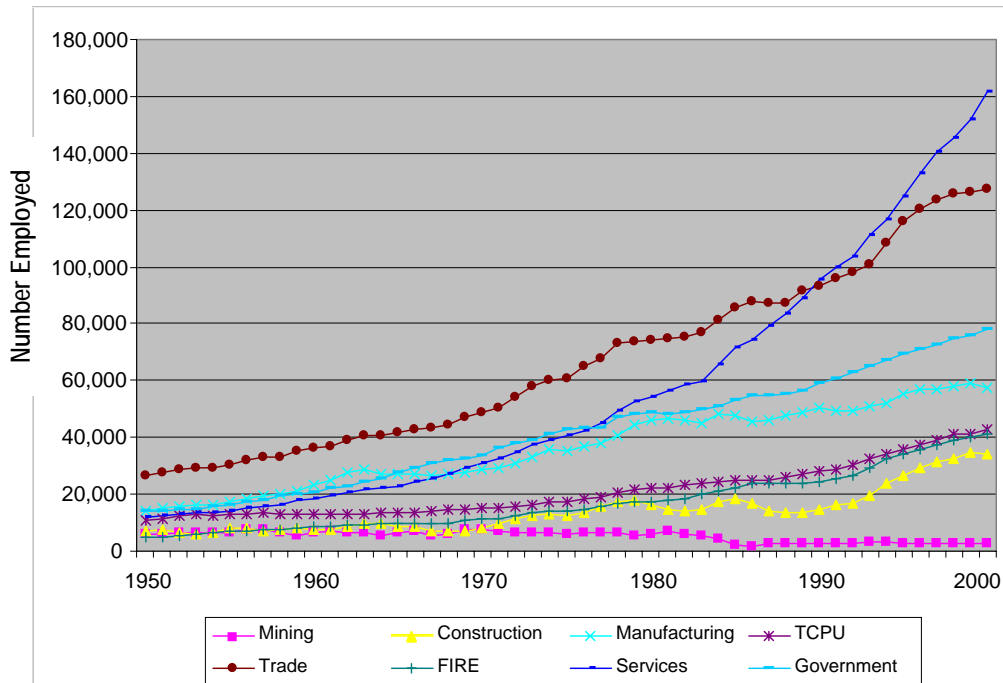
The expected growth in employment and the trend in unemployment are indicative of a positive regional economy.

Figure 3.6-1: Utah County Non-Agricultural Employment by Industry, 1950 – 2000



Source: (GOPB, 2005) TCPU – Transportation Communications and Utilities

Figure 3.6-2: Salt Lake County Non-Agricultural Employment by Industry, 1950 - 2000



Source: (GOPB, 2005) TCPU – Transportation Communications and Public Utilities

Employment, 2001-2030 Utah and Salt Lake Counties

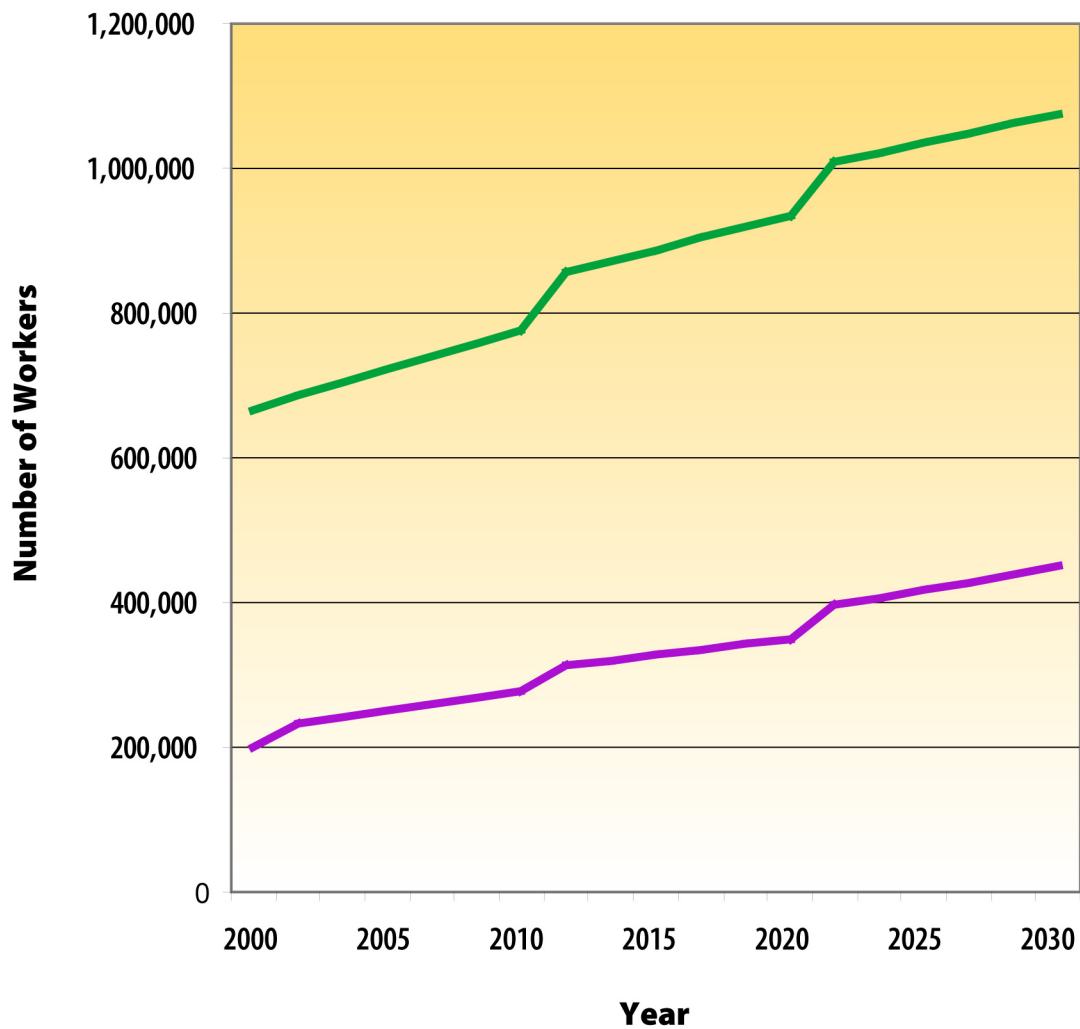


Figure 3.6-3
Employment, 2001 to 2030

LEGEND:

Source: Governor's Office of Planning and Budget

— Salt Lake County Employment

— Utah County Employment

Historic Unemployment Rate, 1980-2006 Utah and Salt Lake Counties

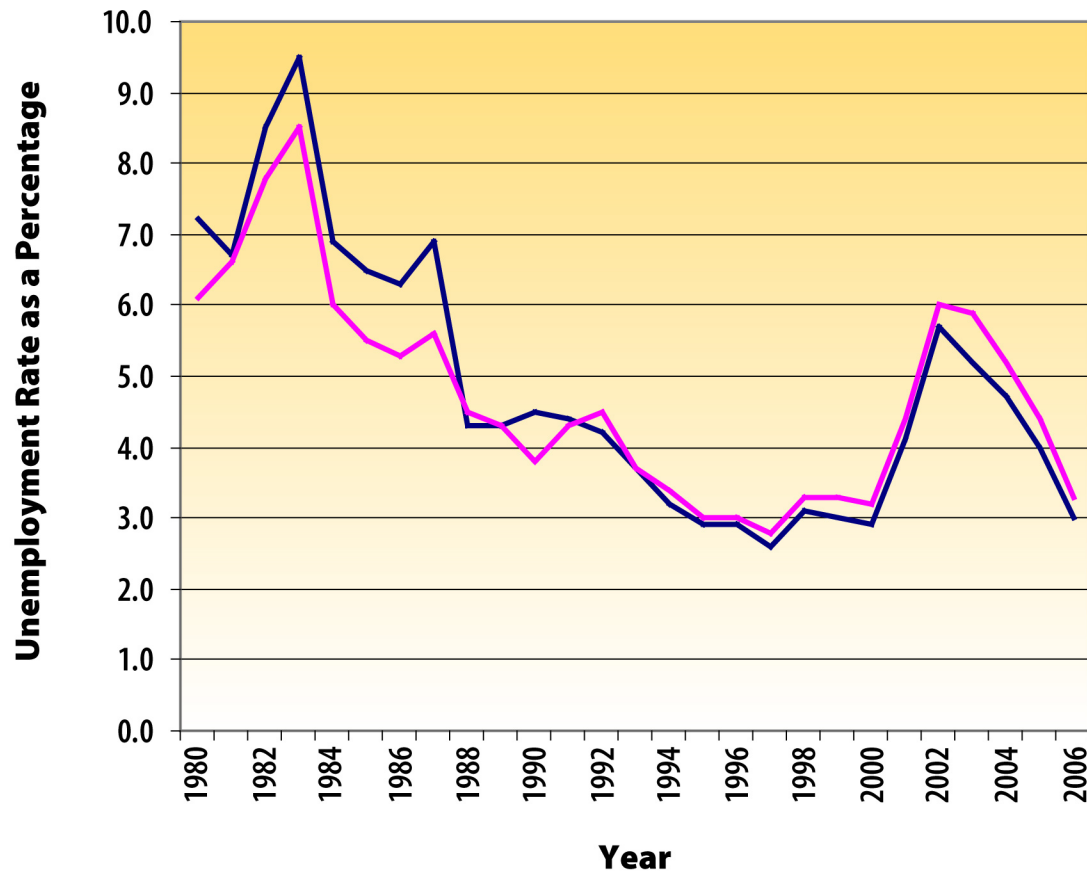


Figure 3.6-4
Historic Unemployment Rate, 1980-2006

LEGEND:

Source: Governor's Office of Planning and Budget

— Utah County Unemployment Rate

— Salt Lake County Unemployment Rate

3.6.2 Alternative 1: No Build

Although the current economic trends anticipated by the GOPB are likely to continue, Alternative 1 - No Build may eventually affect economic growth. As travel conditions on I-15 become more congested, businesses that use I-15 may be affected. Chapter 1 Purpose and Need documents expected traffic growth rates, a function of both population and employment growth in the study area. The transportation impacts of Alternative 1 are also described in Chapter 1. The decreasing LOS and increased delay manifested as peak period congestion may result in new businesses choosing to locate where there is better transportation mobility for their employees, suppliers and customers.

Employment trends and mix of industries and occupations would not change under Alternative 1, although the rate of employment growth may be reduced in response to transportation and mobility constraints. Other economic trends, including those for taxable sales, property values, housing trends, real estate transactions or residential rents would not be appreciably impacted by Alternative 1.

Employment centers and major businesses have likely located near the existing I-15 corridor for visibility, regional, statewide and national access to I-15 as the NAFTA and CANAMEX corridor, and employee and customer access. Substantial change to employment centers and major business locations under Alternative 1 are not expected to occur.

No right-of-way would be acquired under Alternative 1 therefore there would be no decrease in property tax revenues from Alternative 1.

As congestion worsens, the attractiveness of the I-15 corridor for new businesses may decline. The increase in traffic and congestion would also likely reduce the distance that commuters would be willing to travel to employment centers. Other areas not as dependent on the I-15 corridor may become more appealing for development, potentially focusing development elsewhere in the region and changing travel to employment patterns.

Alternative 1 would not be consistent with CANAMEX and NAFTA goals for I-15 as a national and international travel and goods movement corridor. Although the existing interstate would continue to provide the connectivity, Alternative 1 would result in higher levels of congestion and travel time delays.

3.6.3 Alternative 4: I-15 Widening and Reconstruction

The improved level of service, travel time and safety under Alternative 4 would provide the level of mobility in the I-15 corridor that would support the economic activity for Utah and Salt Lake counties projected by the GOPB. The Preferred Alternative is Alternative 4: Widening and Reconstruction, with Option C in the American Fork Main Street Interchange area, and Option D in the Provo/Orem area.

3.6.3.1 Regional Impacts

Alternative 4 would contribute to greater regional mobility between Utah and Salt Lake counties, as envisioned in the regional transportation plans. It would also service existing and planned development within the two counties and the cities through which I-15 passes. The additional mainline capacity and safety would be supportive of goods movement and support I-15's role as a NAFTA corridor and would help meet CANAMEX goals for the Utah section of the CANAMEX I-15 corridor. The reconstruction and widening would be consistent with and supportive of the economic activity envisioned by the GOPB.

3.6.3.2 Business Operations

At the macro level, Alternative 4 would generally improve overall business operations in the I-15 corridor by improving travel time on I-15, reducing freeway congestion, improving access to I-15 through reconstruction of existing interchanges, and improving safety. The addition of new interchanges at 800 South in Orem and at North

Lehi would provide interstate access to adjacent development and lands and potentially enhance the potential for additional business development, subject to local jurisdiction zoning and land use decision-making.

At the micro level, Alternative 4 would require the acquisition of a number of commercial properties and the businesses that occupy those properties. Table 3.4-1 entitled "Summary of Relocation Impacts" (see Section 3.4 Relocations of this chapter) summarizes the number of businesses that would be adversely impacted by Alternative 4 right-of-way acquisition. This would be an adverse impact to between 38 and 70 businesses (38 for the Preferred Alternative), although compensation would be in accordance with the Uniform Relocation and Real Property Acquisition Act of 1970, as amended. Relocation of these business establishments elsewhere within the I-15 corridor and/or within Utah County has the potential to keep these businesses operating and contributing to the local economy.

In addition to acquisition of commercial properties for Alternative 4, 55 existing billboards located on privately owned lands that would be acquired for the I-15 reconstruction would be displaced under Option A or B in the Central Utah County section. Under Options C or D (Preferred), 44 existing billboards would be displaced.

Within the context of the overall Utah County economy and numbers of business establishments, the potential loss of these businesses would not substantially impact the overall economy of the County.

In the Provo/Orem area, Options A and B may improve visibility of businesses that abut the frontage roads. As direct access to frontage roads would be restricted to maintain traffic flow, the economic benefit to these businesses would be minor.

3.6.3.3 Loss of Property Tax Revenue

Alternative 4 would require the purchase of additional right-of-way (ROW). When the purchase of land along the highway transfers ownership from private parties to a public entity, there is a net loss of tax revenue to Utah and Salt Lake counties. The majority of ROW requirements for Alternative 4 would be small portions of parcels adjacent to the existing highway. In many cases, this right-of-way can be acquired without adversely impacting property improvements, such as buildings and other structures. Nonetheless, acquisition of a portion of a parcel without impacting the property improvements may result in, not only a reduction in the assessed value of the parcel remainder, but in a reduction of the improvement's value by lowering its utility in the context of the smaller parcel size.

Using the conceptual engineering designs for Alternative 4 contained in Volume II of this EIS, the number and size of private party ROW purchases that would likely be required throughout the corridor was identified. The area impacted by Alternative 4 on each parcel was calculated and the impact designated as either a partial take or a full take.

The existing tax information for each affected parcel was obtained from the Utah County and Salt Lake County Assessor's Office on-line databases. The loss of tax revenue was estimated by calculating the area affected as a percentage of the total parcel area and using the resultant ratio to estimate the amount of tax revenue lost. For example, a property that would be 25% acquired and that currently pays \$2,400 in taxes would result in a loss of \$600 in tax revenue (0.25 times \$2,400 = \$600). The resultant estimates shown in Table 3.6-1 are for comparison purposes and are subject to change, based upon refinements to the area of impact during final design and right-of-way negotiations, and potential changes in property tax assessments.

As summarized in Table 3.6-1, the combined reduction in property tax from the conversion of private property to I-15 right-of-way would range from \$704,491 to \$783,100 per year.

Table 3.6-1: Estimated Loss of Property Taxes Revenue from Alternative 4

Geographic Section	Design Option	Property Tax Revenue Lost per year	Total Taxes Paid by Affected Properties per year
South Utah County	N/A	\$65,400	\$958,200
Central Utah County	A	\$232,800	\$1,145,700
	B	\$219,100	\$1,423,200
	C	\$181,700	\$1,375,400
	D*	\$177,500	\$1,212,200
Area common to all options		\$174,665	\$1,067,418
TOTAL Central Utah County		\$352,165 to \$407,465	\$2,279,618 to \$2,490,618
North Utah County			
American Fork Main Street	A	\$44,726	\$455,600
American Fork Main Street	B	\$47,825	\$288,487
American Fork Main Street	C*	\$68,035	\$340,796
North (common to all options)		\$211,400	\$1,611,000
TOTAL North Utah County		\$256,126 to \$279,435	\$1,899,487 to \$2,066,600
South Salt Lake County	N/A	\$30,800	\$836,000
		Total Property Taxes	\$5,973,305 to \$6,351,418
TOTAL TAX REVENUE LOST		\$704,491 to \$783,100	

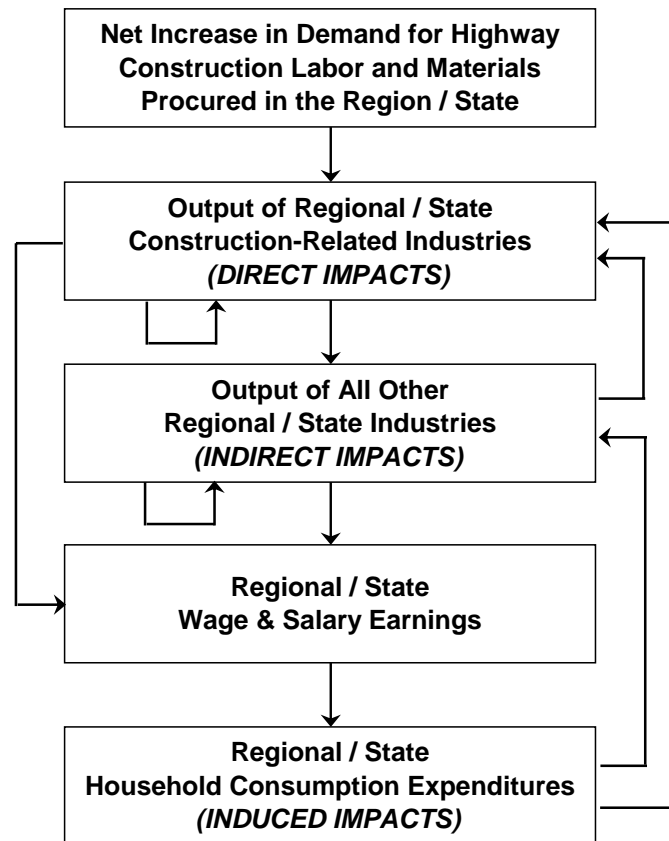
* Part of the Preferred Alternative

3.6.3.4 Impacts of Construction Capital Investment

Temporary local and/or statewide economic benefits would result from the construction capital investment in the I-15 reconstruction project. Construction and capital investment expenditures associated with highway construction would occur over several years, directly creating new demand for construction materials and jobs. To the extent that the direct labor and materials are procured from within the local economy or from within the state, they would lead to indirect or secondary impacts, as the production of output (goods and services) by firms in other industries increases to supply the demand for inputs to the construction industry. The direct and indirect impacts of construction expenditures cause firms in all industries to employ more workers to meet increases in demand. This leads to induced impacts as the additional wages and salaries paid to workers generate increased consumer spending in many economic sectors. In the context of economic evaluations, "induced" refers to the additional economic activity that is generated by the initial expenditure of construction funds.

The initial construction expenditures create a multiplied impact on the local and/or statewide economy in terms of overall economic activity/output, employment, and employment earnings. Figure 3.6-5 presents a flowchart that illustrates the multiplied indirect and induced impacts of direct expenditures on highway construction.

Figure 3.6-5: Construction Spending Multiplier Reactions



The multiplied impacts described above can be estimated using regional multipliers prepared by the Bureau of Economic Analysis (BEA) of the US Department of Commerce, as part of the national input-output accounts. Multipliers from the BEA's Regional Input-Output Modeling System (RIMS II) were obtained for Utah and Salt Lake counties and for the entire State of Utah.

3.6.3.5 Gross Economic Impacts of I-15 Improvement Expenditures

The expenditure of construction funds for the construction of Alternative 4 would have indirect and induced impacts on the regional economy.

Tables 3.6-2 and 3.6-3 present the gross multiplied economic (GME) impacts to Utah and Salt Lake counties from the I-15 construction expenditures. This analysis was conducted on the full 43-mile long corridor estimated capital costs. There are large differences between costs in the Provo/Orem area among Options A, B, C, and D. Options A and B include frontage roads, and Options C and D do not. For that reason, the GME analysis considers a high-cost option (Option A/B), and a low cost option (Option C/D). Using the least cost and highest cost options provides information on the range of benefits that would result from Alternative 4. The total approximate Alternative 4 costs of these options are \$3,278 million for Option A/B and \$3,068 million for Option C/D in fourth quarter 2006 dollars (Q4 2006\$).

Gross impacts from these expenditures include all dollar injections from federal and local sources that would still be spent on goods and services in the area, even if Alternative 4 were not constructed. This investment would create some impacts on the local and state economy.

Economic impacts are divided between funds expended for highway construction and related improvements, right-of-way acquisition, and costs of professional and technical expertise to engineer and manage the project. Utah and Salt

Lake counties are assumed to comprise the “local” economy, such that the majority of the direct expenditures is expected to be expended within these two counties, flowing to labor, material suppliers, and landowners. The remaining 10% is assumed to flow to other in-state sources. Specifically, any local contributions to the project funding would remain local. The two counties would likely still receive some of the state and federal dollars that would have been spent on I-15 via some other public investment if the I-15 project is not undertaken. Table 3.6-2 indicates that 90% of the \$3,068 million cost of Option C/D, or \$2,761 million would be initially expended within the local economy, generating a total gross impact of \$5,901 million in output, 52,697 person-year jobs, and \$1,777 million in associated employment earnings.

Table 3.6-2: GME Impacts of Construction of Option C or D on Utah and Salt Lake Counties

	Direct Expenditures for Highway Improvement Labor & Materials	% Flowing to Utah and Salt Lake Counties (Contributing to Impacts)	I-15 Project Impacts (Option C/D)			
			Direct Expenditures for Highway Improvement within Utah and Salt Lake Counties	Total Direct, Indirect & Induced Impact on Utah and Salt Lake Counties' Economic Output/Activity	Total Direct, Indirect & Induced Impact on Utah and Salt Lake Counties' Employment (all sectors)	Total Direct, Indirect & Induced Impact on Job Earnings in Utah and Salt Lake Counties (all sectors)
Construction Expenditures	\$2,407 M	90%	\$2,166 M	\$4,711 M	42,770 person-yr jobs	\$1,426 M
Engineering & Management	\$516 M	90%	\$464 M	\$998 M	8,975 person-yr jobs	\$327 M
Right-of-Way Expenditures	\$145 M	90%	\$131 M	\$193 M	953 person-yr jobs	\$24 M
Project Totals	\$3,068 M		\$2,761 M	\$5,901 M	52,697 person-yr jobs	\$1,777 M

Option A includes the frontage roads through Provo and Orem and is more expensive than Option C/D, Options A/B's economic impacts from the expenditure of construction funds are slightly higher and are shown in Table 3.6-3.

Table 3.6-3: GME Impacts of Construction of Option A or B on Utah and Salt Lake Counties

	Direct Expenditures for Highway Improvement Labor & Materials	% Flowing to Utah and Salt Lake Counties (Contributing to Impacts)	I-15 Project Impacts (Option A/B)			
			Direct Expenditures for Highway Improvement within Utah and Salt Lake Counties	Total Direct, Indirect & Induced Impact on Utah and Salt Lake Counties' Economic Output/Activity	Total Direct, Indirect & Induced Impact on Utah and Salt Lake Counties' Employment (all sectors)	Total Direct, Indirect & Induced Impact on Job Earnings in Utah and Salt Lake Counties (all sectors)
Construction Expenditures	\$2,573 M	90%	\$2,316 M	\$5,035 M	45,719 person-yr jobs	\$1,524 M
Engineering & Management	\$551 M	90%	\$496 M	\$1,066 M	9,584 person-yr jobs	\$349 M
Right-of-Way Expenditures	\$154 M	90%	\$139 M	\$205 M	1,012 person-yr jobs	\$26 M
Project Totals	\$3,278 M		\$2,950 M	\$6,306 M	56,315 person-yr jobs	\$1,899 M

Tables 3.6-4 and 3.6-5 present the gross multiplied economic impacts to the entire State of Utah from the I-15 construction expenditures of reconstruction Options C/D and A/B. Expenditures are again broken out by construction activities, right-of-way purchases and engineering and management costs. With the local economy expanded to include the entire state, 100% of the direct expenditures would likely flow to labor, material suppliers, and landowners located within Utah.

Table 3.6-4: GME Impacts of Construction of Option C or D on the State of Utah

	Direct Expenditures for Highway Improvement Labor & Materials	% Flowing to Utah (Contributing to Impacts)	I-15 Reconstruction Project Impacts (Option C/D)			
			Direct Expenditures for Highway Improvement within Utah	Total Direct, Indirect & Induced Impact on Utah Economic Output/Activity	Total Direct, Indirect & Induced Impact on Utah Employment (all sectors)	Total Direct, Indirect & Induced Impact on Job Earnings in Utah (all sectors)
Construction Expenditures	\$2,407 M	100%	\$2,407 M	\$5,655 M	56,757 person-yr jobs	\$1,884 M
Engineering & Management	\$516 M	100%	\$516 M	\$1,177 M	11,794 person-yr jobs	\$425 M
Right-of-Way Expenditures	\$145 M	100%	\$145 M	\$218 M	1,185 person-yr jobs	\$30 M
Project Totals	\$3,068 M		\$3,068 M	\$7,050 M	69,736 person-yr jobs	\$2,340 M

Table 3.6-4 indicates that the full \$3,068 million cost of Option C/D would generate a total gross impact of \$7,050 million in output, 63,736 person-year jobs, and \$2,340 million in associated employment earnings. Impacts associated with Option A/B are, again, slightly higher as shown in Table 3.6-5.

Table 3.6-5: GME Impacts of Construction of Option A or B on the State of Utah

	Direct Expenditures for Highway Improvement Labor & Materials	% Flowing to Utah (Contributing to Impacts)	I-15 Reconstruction Project Impacts (Option A/B)			
			Direct Expenditures for Highway Improvement within Utah	Total Direct, Indirect & Induced Impact on Utah Economic Output/Activity	Total Direct, Indirect & Induced Impact on Utah Employment (all sectors)	Total Direct, Indirect & Induced Impact on Job Earnings in Utah (all sectors)
Construction Expenditures	\$2,573 M	100%	\$2,573 M	\$6,045 M	60,671 person-yr jobs	\$2,014 M
Engineering & Management	\$551 M	100%	\$551 M	\$1,256 M	12,594 person-yr jobs	\$454 M
Right-of-Way Expenditures	\$154 M	100%	\$154 M	\$232 M	1,258 person-yr jobs	\$32 M
Project Totals	\$3,278 M		\$3,278 M	\$7,533 M	74,523 person-yr jobs	\$2,501 M

Table 3.6-6 shows a summary of the ranges of benefits that would accrue from the construction of Alternative 4.

Table 3.6-6: Range of Gross Multiplied Economic Impacts of Construction of Alternative 4

I-15 Reconstruction Project Impacts (total cost)	Lowest* (\$3,068 Million)	Highest** (\$3,278 Million)
Impact on Utah and Salt Lake Counties		
Direct Expenditures for Highway Improvement	\$2,761 M	\$2,950 M
Total Direct, Indirect & Induced Impact	\$5,901 M	\$6,306 M
Total Direct, Indirect & Induced Impact	52,697 person-yr jobs	56,315 person-yr jobs
Total Direct, Indirect & Induced Impact on Job Earnings	\$1,777 M	\$1,899 M
Impact on the State of Utah		
Direct Expenditures for Highway Improvement	\$3,068 M	\$3,278 M
Total Direct, Indirect & Induced Impact	\$7,050 M	\$7,533 M
Total Direct, Indirect & Induced Impact	69,736 person-yr jobs	74,523 person-yr jobs
Total Direct, Indirect & Induced Impact on Job Earnings	\$2,340 M	\$2,501 M

* With Option C/D in the Central Utah County Section.

** With Option A/B in the Central Utah County Section.

3.6.3.6 Indirect Impacts

The indirect impacts of Alternative 4 on the economy consist of the job creation and additional expenditures during the construction period. These are summarized in Table 3.6-6 above.

3.7 Noise

The existing noise environment along the I-15 corridor and the impacts of Alternatives 1 and 4 on noise sensitive land uses are described in this section. Since publication of the DEIS, UDOT updated its Noise Policy, including the Noise Abatement Criteria (January 15, 2008). The new policy has been approved by the FHWA, and is used throughout the FEIS. Noise impacts were re-analyzed according to the new traffic model and Noise Abatement Policy, which may create slight changes to the mitigation described in the DEIS.

The Preferred Alternative is Alternative 4: I-15 Widening and Reconstruction, with American Fork Option C and in Provo/Orem area Option D. Option D includes a re-alignment of Provo 820 North, as described in Options A and B in the DEIS.

3.7.1 *Affected Environment*

The characteristics of noise, noise level descriptors, noise regulations, noise impact criteria, and existing noise levels along the I-15 corridor are described in this section.

3.7.1.1 Characteristics of Noise

Sound is defined as vibrations transmitted through the air or other medium as perceived by sense of hearing. *Noise* is defined as sound that is loud, unpleasant, unexpected, or undesired.

Sound consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Likewise, without a medium to transmit sound pressure waves, there is also no sound. And finally, sound must be received—a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise.

A continuous sound can be described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano.

The *amplitude* of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude.

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary, everyday sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. In environmental noise studies, A-weighted sound pressure levels are commonly referred to as noise levels. Table 3.7-1 shows typical A-weighted noise levels.

Table 3.7-1: Weighted Noise Levels and Human Response

Sound Source	Noise Level dBA*	Response Descriptor
Carrier deck jet operation	140	Limit of amplified speech
	130	Painfully loud
Jet takeoff (200 feet)	120	Threshold of feeling and pain
Auto horn (3 feet)		
Riveting machine	110	
Shout (0.5 foot)	100	Very annoying
New York subway station		
Heavy truck (50 feet)	90	Hearing damage (8-hour exposure)
Pneumatic drill		
Passenger train (100 feet)	80	Annoying
Helicopter (in-flight, 500 feet)		
Freight train (50 feet)		
Freeway traffic (50 feet)	70	Intrusive
Air conditioning unit	60	
Light auto traffic (50 feet)		
Normal speech (15 feet)	50	Quiet
Living room, bedroom, library	40	
Soft whisper (15 feet)	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

*Typical A-weighted noise levels taken with a sound-level meter and expressed as decibels on the "A" scale. The "A" scale approximates the frequency response of the human ear.

Source: CEQ, 1970.

3.7.1.2 Noise-Level Descriptors

Noise in our daily environment fluctuates over time. Some of the fluctuations are minor and some are substantial. Some noise levels occur in regular patterns, others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely, others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a discussion of the noise descriptors most commonly used in traffic noise analysis.

Equivalent Sound Level (Leq) - The equivalent sound level (Leq) represents an average of the sound energy occurring over a specified period. Leq is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The one-hour A-weighted equivalent sound level, Leq(h), is the energy average of the A-weighted sound levels occurring during a one-hour period and is the basis for noise abatement criteria (NAC) used by the Department and the FHWA.

Maximum Sound Level (Lmax) - The maximum sound level (Lmax) is the highest instantaneous sound level measured during a specified period.

3.7.1.3 Noise Regulations and Impact Criteria

The United States Code of Federal Regulations Part 772 (23 CFR 772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise", establishes standards for mitigating highway traffic noise. 23 CFR 772 defines the FHWA criteria used to assess noise impacts. The Noise Abatement Criteria (NAC) contained in this regulation have been adopted by UDOT and contained in UDOT's Noise Abatement Policy.

Table 3.7-2 summarizes these criteria. As defined by UDOT's Noise Abatement Policy, a traffic noise impact occurs when a predicted traffic noise level is equal to or greater than the NAC in Table 3.7-2 for the corresponding land use category. A traffic noise impact is also considered to occur when the predicted traffic noise level substantially exceeds the existing noise level, even if the noise levels are below the NAC. A 10 dBA increase over existing noise levels is defined by UDOT as a substantial exceedance.

Table 3.7-2: Noise Abatement Criteria

Activity Category	Leq Noise Levels (dBA)	Description of Activity Category
A	56 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	66 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals
C	71 (exterior)	Developed lands, properties or activities not included in Categories A or B above
D	----	Undeveloped lands
E	51 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Source: USDOT, "Highway Traffic Noise Analysis and Abatement Policy and Guidance", 1995.

3.7.2 Existing Noise Levels

Surveys of the existing land uses along the project corridor were used to identify Category B land uses (residential and recreational properties) that would be sensitive to traffic noise. Thirty-five sites, which represent approximately 910 residences, were chosen as representative of noise-sensitive locations. Existing noise measurements were taken at these 35 sites. Twenty-eight short-term (10- to 20-minute) and seven long-term (24-hour) measurements were taken at these 35 sites. All but one are at residential properties; one is at a park.

The 35 measurement sites were supplemented with the selection of 65 additional modeling sites for use in the FHWA Traffic Noise Model (TNM). The TNM 2.5 models were verified using the actual short-term measurements and traffic counts taken at the time of the measurement. The validated models were then run with the existing peak hour traffic numbers to calculate the modeled peak hour noise level.

Table 3.7-3 summarizes the results of the determination of existing peak hour noise levels. Column 1 specifies the number assigned to each receiver. The numbered receiver designations correspond to the modeled sites within the study area. The receivers designated by a letter (or letters) of the alphabet correspond to short-term measurement sites and twenty-four-hour measurement sites. The address of each receiver site is shown in Column 2. Column 3 indicates the measurement type for each receiver – either short-term measurement, long-term measurement, or modeled. Column 4 lists the modeled peak-hour noise levels for all of the receivers, which will be used in the comparison of existing levels with projected noise levels that would result from the construction of the proposed project.

The locations of the receiver sites are illustrated on Figures 3.7-1 through 3.7-6. Following these figures, the existing peak hour noise levels are described for each project section.

Table 3.7-3: Existing Noise Levels

Note: Levels listed in bold indicate noise impacts as defined in UDOT's Noise Abatement Policy

Receiver #	Address	Measurement Type	Peak Noise Level Leq(h) (dBA)
South Utah County			
1	Residence – 1050 West 550 South Payson	Modeled	70
B	Residence -1028 West 450 South, Payson	Short-Term	69
2	Residence – on 900 West, Payson	Modeled	70
3	Residence – on 200 South, Payson	Modeled	68
4	Residence – on 100 South, Payson	Modeled	66
5	Residence – on 100 North, Payson	Modeled	66
6	Residence – on 300 North, Payson	Modeled	63
7	Residence – at the intersection of 600 West and 300 North, Payson	Modeled	66
A	Residence -400 North 630 West, Payson	24-Hour	63
8	Residence – between 300 North and 400 North, Payson	Modeled	65
9	Residence – on 500 West, Payson	Modeled	64
D	Residence -475 Nebeker Lane, Payson	Short-Term	70
10	Residence – on 500 West, Payson	Modeled	62
11	Residence – on 300 West, Payson	Modeled	72
E	Residence -1952 West 7300 South, Spanish Fork	Short-Term	70
12	Residence – on 6930 South, Spanish Fork	Modeled	65
F	Residence -6832 Larsen Road, Spanish Fork	Short-Term	66
G	Residence -254 North 920 West, Spanish Fork	Short-Term	65
13	Residence – on 350 North, Spanish Fork	Modeled	62
14	Residence – on 500 North, Spanish Fork	Modeled	74

Table 3.7-3: Existing Noise Levels – continued

Note: Levels listed in bold indicate noise impacts as defined in UDOT's Noise Abatement Policy

Receiver #	Address	Measurement Type	Peak Noise Level Leq(h) (dBA)
South Utah County continued			
C	Residence -541 Mitchell Drive, Spanish Fork	24-Hour	74
15	Residence – on Mitchell Drive, Spanish Fork, between 600 North and 700 North	Modeled	73
16	Residence – on 900 North, Spanish Fork	Modeled	65
Central Utah County			
I	301 Lakewood Drive, Provo	Short-Term	64
17	Residence – on 300 West, Provo	Modeled	64
18	Residence/Park – on 400 west, Provo	Modeled	66
19	Residence – at intersection of 1150 South and South Frontage Road, Provo	Modeled	63
20	Residence – on South Frontage Road, Provo	Modeled	63
21	Residence – at intersection of 500 West and 1200 South, Provo	Modeled	64
22	Residence – at intersection of 600 West and 1020 South, Provo	Modeled	63
J	Residence -792 and 796 West 1020 South, Provo	Short-Term	63
H	Residence -880 58 Stubbs Avenue, Provo	24-Hour	76
23	Residence – at intersection of Stubbs Avenue and Heather Lane, Provo	Modeled	62
24	Residence – on 770 South, Provo	Modeled	62
25	Residence – on 1100 West, Provo	Modeled	62
26	Residence – at intersection of 600 South and 950 West, Provo	Modeled	64
27	Residence – on 600 South, Provo	Modeled	63
28	Residence – at intersection of 430 South and 1220 West, Provo	Modeled	65
K	Residence -126 1470 West, Provo	Short-Term	63
29	Residence – at intersection of 50 North and 1600 West, Provo	Modeled	63

Table 3.7-3: Existing Noise Levels – continued

Note: Levels listed in bold indicate noise impacts as defined in UDOT's Noise Abatement Policy

Receiver #	Address	Receiver Type	Peak Noise Level Leq(h) (dBA)
Central Utah County – continued			
30	Residence – at intersection of 150 North and 1600 West, Provo	Modeled	64
L	Unit 88 of the Lamplighter Mobile Estates, Provo	Short-Term	64
M	Unit 28 of the Mobile Home Estates on Geneva Road, Provo	Short-Term	68
31	Residence – on Geneva Road, Provo	Modeled	67
N	Residence -1134 Independence Avenue, Provo	Short-Term	65
32	Residence – on Lakeview Drive, Provo	Modeled	74
O	Residence -2367 West 220 South, Provo	24-Hour	78
R	Residence -1756 Sandhill, Orem	Short-Term	65
33	Residence – at intersection of 1200 West and 680 South, Orem	Modeled	64
33A	696 South 1035 West, Orem	Short-Term	53
S	Courtside Place Condominiums, Orem	Short-Term	74
34	Residence – at intersection of 400 South and 1200 West, Orem	Modeled	75
35	Residence – on 1200 West, Orem	Modeled	72
P	Newport Village Condominiums, Orem	24-Hour	74
36	Apartments – on 1380 North, Orem	Modeled	66
T	Residence -1446 North 1300 West, Orem	Short-Term	68
37	Apartments – on 1335 West, Orem	Modeled	75
North Utah County			
U	Residence -620 South 330 East, American Fork	Short-Term	75
38	Residence – at intersection of 5750 West and 500 South, American Fork	Modeled	70
39	Residence – at intersection of Center Street and 400 South, American Fork	Modeled	76
V	Residence -279 South 100 West, American Fork	Short-Term	77

Table 3.7-3: Existing Noise Levels – continued

Note: Levels listed in bold indicate noise impacts as defined in UDOT's Noise Abatement Policy

Receiver #	Address	Receiver Type	Peak Noise Level Leq(h) (dBA)
North Utah County - continued			
40	Residence – at intersection of 200 West and 200 South, American Fork	Modeled	74
W	Residence -2839 Barratt Circle, American Fork	Short-Term	63
Q	Lions Park, American Fork	24-Hour	68
41	Residence – on Chadwick Circle, American Fork	Modeled	66
42	Residence – at intersection of 200 South and 300 West, American Fork	Modeled	69
43	Residence – at north end of Mahogany Drive	Modeled	74
AF-1	1100 West Main Street, American Fork	Short-Term	66
AF-2	7941 7340 West, American Fork	Short-Term	56
AF-3	6785 West 200 South, American Fork	Short-Term	59
AF-4	Two Residences North of West 7750 North, American Fork	Modeled	55
AF-5	Residence – South of West 7550 North, American Fork	Modeled	56
AF-6	Residence – North of West 7550 North, American Fork	Modeled	55
AF-7	Residence – North of West 7550 North, American Fork	Modeled	46
AF-8	New Homes – South of West 7550 North on Gray Goose Road, American Fork	Modeled	65
44	Residence – on 900 East between State Street and 500 North, Lehi	Modeled	65
Y	Residence -750 East 500 North, Lehi	Short-Term	68
45	Residence – on 625 East, Lehi	Modeled	74
Z	Residence -825 North 400 East, Lehi	Short-Term	71
46	Residence – on Frontage Road, Lehi between 900 North and 200 East	Modeled	67
47	Residence – on Frontage Road, Lehi between 200 East and Shelton Ave	Modeled	67
48	Residence – at Trailer Park, South 1200 North, Lehi	Modeled	72

Table 3.7-3: Existing Noise Levels – continued

Note: Levels listed in bold indicate noise impacts as defined in UDOT's Noise Abatement Policy

Receiver #	Address	Receiver Type	Modeled Peak Noise Hour Level (dBA)
North Utah County - continued			
49	Residence – on Frontage Road, Lehi between Shelton Ave and Cedar Hollow Rd	Modeled	75
50	Residence – on 1200 North, Lehi	Modeled	68
X	Residence -1326 Cedar Hollow Drive, Lehi	24-Hour	68
51	Residence – at intersection of Frontage Road and 250 West, Lehi	Modeled	67
AA	Lot 17 of Hansen Community Mobile Homes, 1235 North 300 West, Lehi	Short-Term	63
52	Residence – at intersection of Frontage Road and 500 West, Lehi	Modeled	67
53	Lot 24 of Hansen Community Mobile Homes, 1235 North 300 West, Lehi	Modeled	61
54	Residence – at intersection of Frontage Road and 600 West, Lehi	Modeled	69
55	Residence – on 600 West, Lehi	Modeled	61
56	Residence – on Railroad Street	Modeled	72
BB	Brookestone Apartments, 900 West 2100 North, Lehi	Short-Term	73
57	Residence – on State Street, Lehi	Modeled	71
CC	Residence -2140 N State Street, Lehi	Short-Term	70
58	Residence – on 2100 North, Lehi	Modeled	68
South Salt Lake County			
59	Residence – on Minuteman Drive, Draper - between Bangerter Highway and 13275 South	Modeled	72
EE	Pinnacle Reserve Apartments, 13343 Minuteman Drive, Draper	Short-Term	73
60	Residence – on Pony Express Drive, Draper - between Bangerter Highway and Golden Harvest Road	Modeled	72
FF	Residence -12712 Pony Express Road, Draper	Short-Term	74

3.7.2.1 South Utah County Section

The South Utah County section includes the towns of Payson and Spanish Fork. The land use within the towns is a mix of commercial uses and single-family homes. Outside the towns the land use is mostly open farm land with scattered single-family homes. Measurements were taken at two 24-hour receivers (receivers A and C) and five short-term receivers (receivers B, D, E, F, and G). Their locations are shown on Figures 3.7-1 and 3.7-2. Homes closer to or more exposed to I-15 would have higher noise levels than homes that are further away or protected by some form of shielding such as other buildings or walls. The peak hour measured noise levels range from 63 to 74 dBA. Sixteen additional sites were modeled in the TNM model to supplement the measured sites. Using existing peak hour traffic, the modeled existing peak hour noise levels range from 62 to 74 dBA. The NAC (66 dBA) is reached or exceeded at 14 of the 23 measured and modeled sites.

3.7.2.2 Central Utah County Section

The Central Utah County section includes the towns of Provo, Orem and parts of Lindon. The land use in the area is a mix of open space, commercial and single- and multi-family land uses. Measurements were taken at three 24-hour receivers (receivers H, O and P) and ten short-term receivers (I, J, K, L, M, N, R, 33A, S, T). Their locations are shown in Figures 3.7-3 and 3.7-4. The peak hour measured noise levels range from 55 to 75 dBA. The homes close or more exposed to I-15 would have the higher noise level, than the homes further away or with some shielding, building or walls, from I-15. Twenty-one additional sites were modeled in the TNM model to supplement the measured sites. Using existing peak hour traffic, the modeled existing peak hour noise levels range from 62 to 78 dBA. The NAC (66 dBA) is reached or exceeded at 13 of the 34 measured and modeled sites.

3.7.2.3 North Utah County Section

The North Utah County section includes parts of Lindon and through Pleasant Grove, American Fork and Lehi. Outside of the towns of American Fork and Lehi, the land use is a mix of mostly open farm land with some commercial and industrial uses. Land uses within American Fork and Lehi are a mix of commercial, industrial and single-and multi-family homes.

Measurements were taken at two 24-hour receivers (receivers Q and X) and 11 short-term receivers (U, V, W, AF-1, AF-2, AF-3, Y, Z, AA, BB, CC). The receiver locations are shown in Figure 3.7-5. The peak hour measured noise levels range from 59 to 77 dBA. Homes closer to or more exposed to I-15 would have higher noise levels than homes that are further away or protected by some form of shielding such as other buildings or walls. Twenty-six additional sites were modeled in TNM to supplement the measured sites. Using existing peak hour traffic, the modeled existing peak hour noise levels range from 46 to 76 dBA. The NAC (66 dBA) is reached or exceeded at 27 of the 39 measured and modeled sites.

3.7.2.4 South Salt Lake County Section

The South Salt Lake County section includes the towns of Bluffdale and Draper. Outside Draper, the land uses are generally undeveloped or are part of active sand and gravel extraction quarry. Land uses within Draper are a mix of commercial, industrial and single-and multi-family homes.

Measurements were taken at two short-term receivers (receivers EE and FF). Their locations are shown in Figure 3.7-6. The peak hour measured noise levels range from 73 to 74 dBA. Homes closer to or more exposed to I-15 would have higher noise levels than homes that are further away or protected by some form of shielding such as other buildings or walls. Two additional sites were modeled in TNM to supplement the measured sites. Using existing peak hour traffic, the modeled existing peak hour noise levels were 72 dBA. The NAC (66 dBA) is reached or exceeded at all four measured and modeled sites.